# BS IN BIOLOGICAL SCIENCE (ECOLOGY, EVOLUTION, AND CONSERVATION)

**Units required for Major: 73-85, includes units of study in chosen concentration (see below).**
**Total units required for BS: 120**

## Program Description

The concentration in Ecology, Evolution, and Conservation is designed for students interested in wildlife management, conservation biology, or pursuing graduate study in ecological and evolutionary approaches in the Biological Sciences. By choosing the concentration, students get necessary training for a career working with local, state, or federal agencies as a biologist or environmental scientist. It will also prepare students for graduate study in the Biological Sciences.

## Program Requirements

| Code | Title | Units |
|---|---|---|
| **Required Lower Division Core Courses (37-41 Units)** | | |
| BIO 1 | Biodiversity, Evolution and Ecology [1] | 5 |
| BIO 2 | Cells, Molecules and Genes | 5 |
| CHEM 1A | General Chemistry I [1] | 5 |
| CHEM 1B | General Chemistry II | 5 |
| Select one of the following: | | 3 - 6 |
| CHEM 20 | Organic Chemistry Lecture--Brief Course [2] | |
| CHEM 24 & CHEM 124 | Organic Chemistry Lecture I<br>Organic Chemistry Lecture II | |
| Select one of the following: | | 3 - 4 |
| MATH 26A | Calculus I for the Social and Life Sciences | |
| MATH 30 | Calculus I | |
| PHYS 5A | General Physics: Mechanics, Heat, Sound | 4 |
| PHYS 5B | General Physics: Light, Electricity and Magnetism, Modern Physics | 4 |
| STAT 1 | Introduction to Statistics [1] | 3 |
| **Required Upper Division Core Courses (7 Units)** | | |
| BIO 100 | Introduction to Scientific Analysis | 3 |
| BIO 184 | General Genetics | 4 |
| **Concentration (29-37 Units)** | | |
| Select from the following concentrations: | | 29 - 37 |
| General Biology | | |
| Biomedical Sciences | | |
| Cell and Molecular Biology | | |
| Clinical Laboratory Sciences | | |
| Ecology, Evolution, and Conservation | | |
| Forensic Biology | | |
| Microbiology | | |
| **Total Units** | | **73-85** |

[1] Course also satisfies General Education (GE)/Graduation Requirement.
[2] CHEM 24 and CHEM 124 may be taken in lieu of CHEM 20. (CHEM 124 is not counted toward the 36 upper division unit requirement in the major except in the Biomedical Sciences Concentration.)

**Notes:**

- Pre-Health Professional students should take the Chemistry and Math requirements as stated in the Pre-Health Professional Program section of this catalog.
- With approval, up to six units of upper division coursework from related fields may be applied as electives in the major.

Concentration in Ecology, Evolution, and Conservation (29 units)

| Code | Title | Units |
|---|---|---|
| **Required Courses (14 Units)** | | |
| BIO 160 | General Ecology | 3 |
| BIO 167 | Quantitative Methods in Biology | 3 |
| BIO 178 | Molecular Ecology | 4 |
| BIO/ENVS 186B | Ecological and Environmental Issues Seminar | 1 |
| BIO 188 | Evolution | 3 |
| **Elective Courses (15 Units)** | | |
| Select one of the following Structure and Function electives: | | 3 |
| BIO 104 | Physiology of Human Reproduction | |
| BIO 122 | Advanced Human Anatomy | |
| BIO 123 | Neuroanatomy | |
| BIO 126 | Comparative Vertebrate Morphology | |
| BIO 127 | Developmental Biology | |
| BIO 128 | Plant Anatomy and Physiology | |
| BIO 130 | Histology | |
| BIO 131 | Systemic Physiology | |
| BIO 132 | Neurophysiology | |
| BIO 133 | Cardiovascular, Respiratory and Renal Physiology | |
| Select three of the following Ecology, Evolution, and Biodiversity electives: [1] | | 9 |
| *Part A: Biodiversity Electives* | | |
| BIO 103 | Plants and Civilization | |
| BIO 112 | Plant Taxonomy | |
| BIO 145 | The Diversity of Microorganisms | |
| BIO 152 | Human Parasitology | |
| BIO 157 | General Entomology | |
| BIO 162 | Ichthyology: The Study of Fishes | |
| BIO 164 | Amphibians and Reptiles: An Introduction to Herpetology | |
| BIO 166 | Ornithology | |
| BIO 168 | Mammalogy | |
| *Part B: Ecology and Evolution Electives* | | |
| BIO 113 | Evolution and Speciation in Flowering Plants | |
| BIO 118 | Natural Resource Conservation | |
| BIO 169 | Animal Behavior | |
| BIO 173 | Principles of Fisheries Biology | |
| BIO 179 | Conservation Biology & Wildlife Management | |

| | |
|---|---|
| Select additional upper division elective courses in consultation with an advisor to total 15 upper division elective units | 3 |
| **Total Units** | **29** |

[1] At least one course must be from Part A and one course from Part B (each course must be a minimum of 3 units).

- No more than 3 units from the following combined can be applied to the Biological Sciences upper division major requirement. No more than 2 units from BIO 195 and 197 series courses may count toward this requirement.

| Code | Title | Units |
|---|---|---|
| BIO 195 | Biological Internship | 1 - 2 |
| BIO 197A | Laboratory Teaching Assistant | 1 - 2 |
| BIO 197B | Laboratory Techniques | 1 - 2 |
| BIO 197C | Co-curricular Activities in Biology | 1 - 2 |
| BIO 199A | Introductory Undergraduate Research | 1 - 2 |
| BIO 199B | Directed Readings | 1 - 2 |

# General Education Requirements [1]

| Code | Title | Units |
|---|---|---|
| **Area A: Basic Subjects (9 Units)** | | |
| A1 - Oral Communication | | 3 |
| A2 - Written Communication | | 3 |
| A3 - Critical Thinking | | 3 |
| **Area B: Physical Universe and Its Life Forms (3 Units)** | | |
| B1 - Physical Science [2] | | 0 |
| B2 - Life Forms [2] | | 0 |
| B3 - Lab (Note: Lab experience to be taken with one of the following: B1, B2 or B5) [2] | | 0 |
| B4 - Math Concepts [2] | | 0 |
| B5 - Additional Course (Any B to reach 12 units) - Take upper-division course to complete Area & upper division requirements. | | 3 |
| **Area C: Arts and Humanities (12 Units)** | | |
| C1 - Arts | | 3 |
| C2 - Humanities | | 3 |
| C1/C2 - Area C Course | | 3 |
| C1/C2 - Area C Course - Take upper-division course to complete Area & upper division requirements. | | 3 |
| **Area D: The Individual and Society (9 Units)** | | |
| Area D Course | | 3 |
| Area D Course | | 3 |
| Area D Course - Take upper-division course to complete Area & upper division requirements. | | 3 |
| **Area E: Understanding Personal Development (3 Units)** | | |
| Area E Course | | 3 |
| **Area F: Ethnic Studies (3 Units)** | | |
| Area F Course | | 3 |
| **Total Units** | | **39** |

[1] To help you complete your degree in a timely manner and not take more units than absolutely necessary, there are ways to use single courses to meet more than one requirement (overlap). For further information, please visit the General Education page (https://catalog.csus.edu/colleges/academic-affairs/general-education/).
**Note:** There is no way to list all possible overlaps so please consult with a professional advisor. The Academic Advising Center can be visited online (http://www.csus.edu/acad/), by phone (916) 278-1000, or email (advising@csus.edu).

[2] Required in Major; also satisfies GE.

## Graduation Requirements [1]

| Code | Title | Units |
|---|---|---|
| **Graduation Requirements (required by CSU) (9 Units)** | | |
| American Institutions: U.S. History | | 3 |
| American Institutions: U.S. Constitution & CA Government | | 3 |
| Writing Intensive (WI) | | 3 |
| **Graduation Requirements (required by Sacramento State) (12 Units)** | | |
| English Composition II | | 3 |
| Race and Ethnicity in American Society (RE) | | 3 |
| Foreign Language Proficiency Requirement [2] | | 6 |

[1] To help you complete your degree in a timely manner and not take more units than absolutely necessary, there are ways to use single courses to meet more than one requirement (overlap). For further information, please visit the General Education page (https://catalog.csus.edu/colleges/academic-affairs/general-education/).
**Note:** There is no way to list all possible overlaps so please consult with a professional advisor. The Academic Advising Center can be visited online (http://www.csus.edu/acad/), by phone (916) 278-1000, or email (advising@csus.edu).

[2] If not satisfied before entering Sacramento State, it may be satisfied in General Education Area C2 (Humanities). "C- or better required." The alternative methods for satisfying the Foreign Language Proficiency Requirement are described here: https://www.csus.edu/college/arts-letters/world-languages-literatures/foreign-language-requirement.html (https://www.csus.edu/college/arts-letters/world-languages-literatures/foreign-language-requirement.html)

*The following roadmaps are sample planning resources. Please consult your academic advisor and Academic Catalog for graduation requirements as you develop your individualized academic plan.*

## Biological Science (Ecology, Evolution, and Conservation), BS: 4-Year Roadmap

| Course | Title | Units |
|---|---|---|
| **Year 1** | | |
| **First Semester** | | |
| MATH 26A or MATH 30 | Calculus I for the Social and Life Sciences or Calculus I | 3 - 4 |
| GE Area 1A - English Composition [2] | | 3 |
| GE Area 1C - Oral Communication [2] | | 3 |
| GE Area 6 - Ethnic Studies [2] | | 3 |
| Elective of Choice | | 3 |
| | **Units** | **15-16** |

| | | |
|---|---|---|
| **Second Semester** | | |
| CHEM 1A | General Chemistry I | 5 |
| STAT 1 | Introduction to Statistics | 3 |
| GE Area 1B - Critical Thinking [2] | | 3 |
| Elective of Choice | | 3 |
| | **Units** | **14** |
| **Year 2** | | |
| **First Semester** | | |
| BIO 1 | Biodiversity, Evolution and Ecology | 5 |
| CHEM 1B | General Chemistry II | 5 |
| Foreign Language Semester 1 [2] | | 4 |
| Elective of Choice | | 3 |
| | **Units** | **17** |
| **Second Semester** | | |
| BIO 2 | Cells, Molecules and Genes | 5 |
| CHEM 20<br>or CHEM 24<br>or CHEM 124 | Organic Chemistry Lecture--Brief Course [3]<br>or Organic Chemistry Lecture I<br>or Organic Chemistry Lecture II | 3 |
| ENGL 20 | College Composition II | 3 |
| Foreign Language Semester 2 [2] | | 4 |
| | **Units** | **15** |
| **Year 3** | | |
| **First Semester** | | |
| BIO 100 | Introduction to Scientific Analysis | 3 |
| BIO 184 | General Genetics | 4 |
| BIO 186B | Ecological and Environmental Issues Seminar | 1 |
| PHYS 5A | General Physics: Mechanics, Heat, Sound | 4 |
| GE Area 3B - Humanities [2] | | 3 |
| | **Units** | **15** |
| **Second Semester** | | |
| BIO 160 | General Ecology | 3 |
| BIO 167 | Quantitative Methods in Biology | 3 |
| PHYS 5B | General Physics: Light, Electricity and Magnetism, Modern Physics | 4 |
| Structure and Function Elective [3] | | 3 |
| Upper Division GE Area 4 - Social & Behavioral Sciences [2] | | 3 |
| | **Units** | **16** |
| **Year 4** | | |
| **First Semester** | | |
| BIO 178 | Molecular Ecology | 4 |
| BIO 188 | Evolution | 3 |
| Ecology, Evolution, and Biodiversity Elective [3] | | 3 |
| GE Area 3A - Arts [2] | | 3 |
| GR American Institutions (GOVT) [2] | | 3 |
| | **Units** | **16** |
| **Second Semester** | | |
| Ecology, Evolution, and Conservation Elective [3] | | 3 |
| Ecology, Evolution, and Biodiversity Elective [3] | | 3 |
| Ecology, Evolution, and Biodiversity Elective [3] | | 3 |
| Upper Division GE Area 3 - Arts or Humanities + Writing Intensive [2] | | 3 |
| GR American Institutions (US History) [2] | | 3 |
| | **Units** | **15** |
| | **Total Units** | **123-124** |

# Biological Science (Ecology, Evolution, and Conservation), BS: 2-Year Roadmap

| Course | Title | Units |
|---|---|---|
| **Year 1** | | |
| **First Semester** | | |
| BIO 100 | Introduction to Scientific Analysis | 3 |
| BIO 184 | General Genetics | 4 |
| BIO 186B | Ecological and Environmental Issues Seminar | 1 |
| Foreign Language Semester 1 [2] | | 4 |
| Elective of Choice | | 3 |
| | **Units** | **15** |
| **Second Semester** | | |
| BIO 160 | General Ecology | 3 |
| BIO 167 | Quantitative Methods in Biology | 3 |
| Ecology, Evolution, and Biodiversity Elective [3] | | 3 |
| Foreign Language Semester 2 [2] | | 4 |
| GR American Institutions (GOVT) [2] | | 3 |
| | **Units** | **16** |
| **Year 2** | | |
| **First Semester** | | |
| BIO 178 | Molecular Ecology | 4 |
| BIO 188 | Evolution | 3 |
| Ecology, Evolution, and Biodiversity Elective [3] | | 3 |
| Upper Division GE Area 4 - Social & Behavioral Sciences [2] | | 3 |
| Elective of Choice | | 3 |
| | **Units** | **16** |
| **Second Semester** | | |
| Ecology, Evolution, and Conservation Elective [3] | | 3 |
| Structure and Function Elective [3] | | 3 |
| Ecology, Evolution, and Biodiversity Elective [3] | | 3 |
| Upper Division GE Area 3 - Arts or Humanities + Writing Intensive [2] | | 3 |
| GR American Institutions (US History) [2] | | 3 |
| | **Units** | **15** |
| | **Total Units** | **62** |

1. Any course not completed in the first semester should be taken in the second or a later semester.
2. Please see General Education/Graduation Requirement **course options (https://www.csus.edu/academic-affairs/curriculum-%20workflow/_internal/_documents/program-road-maps/als_2yr/art_transfer-%20roadmap-2024-25.pdf)**.
3. Please see an academic advisor for elective options.